



September 3, 2013

Mr. Kevin Bilash
U.S. Environmental Protection Agency
1650 Arch Street
WCMD 3WC 22
Philadelphia, PA 19103

Re: AOI-6 Review of Site-Specific Soil and Groundwater Criteria for the Philadelphia Energy Solutions Facility

Dear Mr. Bilash:

Sunoco, Inc. (R&M) (Sunoco) is submitting this letter to United States Environmental Protection Agency (EPA) summarizing the results of the recent Area of Interest 6 (AOI-6) Site Characterization Report/Remedial Investigation Report (SCR/RIR) in comparison to the calculated industrial regional screening levels (RSLs). The basis and background for these calculated RSLs were submitted to EPA in correspondence from Sunoco dated November 7, 2012 (Attachment 1) for the following compounds:

Soil: Benzo(g,h,i)perylene, Ethylbenzene, Naphthalene, and Phenanthrene.

Groundwater: Naphthalene and Phenanthrene.

As outlined in the November 7 correspondence to EPA, the soil and groundwater data collected for the above specified compounds as part of the AOI-6 SCR/RIR for the Philadelphia Energy Solutions (PES) Facility were compared to the calculated industrial RSLs. The results of this comparison are discussed [by medium] in the sections below. The remaining analytes were compared to the PADEP medium specific concentrations (MSCs) in accordance with Act 2 and are summarized in the AOI-6 SCR/RIR.

Soil

The AOI-6 SCR/RIR soil data results for the above specified compounds are summarized in Tables 1a and 1b and compared to the site-specific RSLs. For your reference, any concentrations exceeding the more stringent value of the either the PADEP MSC or the RSL are highlighted. As presented in Tables 1a and 1b, eighty-three surface soil samples and twenty-six sub-surface soil samples were analyzed. Of these samples, no concentrations of Benzo(g,h,i)perylene, or Phenanthrene were detected above the RSL or the PADEP Non-

Residential Soil MSC. Concentrations of Ethylbenzene were detected above the RSL [27 milligrams per kilogram (mg/kg)] in six samples:

- Four surface samples
 - BH-12-108_1' @ 57.1 mg/kg;
 - HA-1 (1-1.5) @ 80 mg/kg;
 - HA-3 (1-1.5) @ 37 mg/kg; and
 - HA-4 (1-1.5) @ 55 mg/kg.
- Two sub-surface samples
 - BH-12-108_2-2.5' @ 109 mg/kg; and
 - BH-12-128_3-3.5' @ 57.8 mg/kg.

Concentrations of Naphthalene were detected above the RSL [18 mg/kg] in two samples:

- One surface sample
 - BH-12-108_1' @ 25.9 mg/kg.
- One sub-surface sample
 - BH-12-108_2-2.5' @ 65.2 mg/kg.

Risk due to exposure to the maximum detected concentrations [109 mg/kg for Ethylbenzene and 65.2 mg/kg for Naphthalene] are 4.0E-06 and 3.6E-06, respectively. The calculated risks due to exposure for both compounds are well within EPA's acceptable range [1.0E-06 to 1.0E-04]. No additional evaluations are proposed with respect to Benzo(g,h,i)perylene, Phenanthrene, Ethylbenzene and Naphthalene in soil.

Groundwater

The AOI-6 SCR/RIR groundwater data results for the above specified compounds are summarized in Table 2 and compared to the site-specific RSLs. For your reference, any concentrations exceeding the RSLs are highlighted. As presented in Table 2, ninety-three groundwater samples were analyzed: this includes multiple rounds of samples for many wells. While any concentrations that exceed the RSLs are highlighted in Table 2, the following discussion focuses on the most recent analyses for any well. Of these samples, no concentrations of Phenanthrene were detected above the RSL. Concentrations of Naphthalene were detected above the carcinogenic RSL [7.0 micrograms per liter (ug/l)] in seven of the samples:

- B-126_010713 @ 25.3 ug/l;
- B-149_010713 @ 27.7 ug/l;
- B-154_010713 @ 57.3 ug/l;
- B-155_010713 @ 52.4 ug/l;

- B-169_010413 @ 41.7 ug/l;
- U1-060606 @ 60 ug/l; and
- URS5-060606 @ 270 ug/l.

As presented in the November 7 correspondence to the EPA, any Naphthalene data exceeding the carcinogenic RSL was further screened against the non-carcinogenic RSL. All of the samples stated above, except B-126_010713 @ 25.3 ug/l, also exceed the non-carcinogenic RSL for Naphthalene [26 ug/l]. Risk due to exposure to the maximum detected concentration [270 ug/L] is 3.9E-04 and the hazard quotient is 10. Because the risk and hazard quotient are outside acceptable limits and because the concentration was detected over seven years ago we propose collecting a confirmation sample during the next groundwater sample event in January 2014. Additionally, confirmation samples will be collected from any wells identified above with an exceedance of the Naphthalene RSL.

If you have any questions, please feel free to contact me at (610) 833-3444 or jroppenheim@suno coinc.com.

Sincerely,



James Oppenheim, PE
Sr. Environmental Consultant

cc: Kevin McKeever, Langan Engineering
Allison Jelinek, Langan Engineering

Enclosures:

Table 1a – Summary of Surface Soil (0-2 feet) Analytical Results

Table 1b – Summary of Subsurface Soil (2-15 feet) Analytical Results

Table 2 – Summary of Groundwater Analytical Results

Attachment 1 - Sunoco Correspondence November 7, 2012

Tables

Table 1a
Summary of Surface Soil (0-2 ft) Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 B-166			AOI6 B-167			AOI6 B-170			AOI6 BH-12-104			AOI6 BH-12-106												
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data												
				Sample ID	B-166_2'			B-167_2'			B-170_2'			BH-12-104_0.5-1'			BH-12-106_1-1.5'												
				Sample Matrix	Soil			Soil			Soil			Soil			Soil												
				Sample Depth	1.5-2			1.5-2			1.5-2			0.5-1			1-1.5												
				Sample Date	12/13/2012			12/13/2012			12/13/2012			12/4/2012			12/3/2012												
Unit				Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF										
Volatile Organic Compounds				Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.0015	1	0.395	0.048	1	ND	U	0.001	1	ND	U	0.063	1	0.452	0.064	1			
Semi-Volatile Organic				Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.228	0.042	1	0.121	0.034	1	0.486	0.036	1	0.0866	0.038	1	2.17	0.17	5						
				Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.042	1	0.0352	0.034	1	0.114	0.036	1	ND	U	0.32	1	0.994	0.32	1				
				Phenanthrene	85-01-8	10000	170000	mg/kg	0.285	0.042	1	0.108	0.034	1	0.379	0.036	1	ND	U	0.038	1	5.8	0.17	5					

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-107			AOI6 BH-12-108			AOI6 BH-12-111			AOI6 BH-12-111			AOI6 BH-12-112													
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data													
				Sample ID	BH-12-107_1-1.5'			BH-12-108_1'			BH-12-111_0.5-1'			BH-12-111_1-1.5'			BH-12-112_0.5-1'													
				Sample Matrix	Soil			Soil			Soil			Soil			Soil													
				Sample Depth	1-1.5			1.5-2			0.5-1			0.5-1			1-1.5													
				Sample Date	12/3/2012			12/3/2012			12/4/2012			12/4/2012			12/3/2012													
Unit				Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF											
Volatile Organic Compounds				Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.00092	1	0.571	5	1	ND	U	0.25	1	ND	U	0.23	1	ND	U	0.00095	1			
Semi-Volatile Organic				Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	1.81	0.069	2	3.54	0.65	20	1.44	0.17	1	ND	U	0.16	5	0.335	0.034	1						
				Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.0446	1	0.259	1.3	1	ND	U	1.2	1	ND	U	1.2	1	ND	U	0.0048	1			
				Phenanthrene	85-01-8	10000	170000	mg/kg	3.02	0.069	2	14.9	0.85	20	1.74	0.17	1	0.68	0.16	5	0.51	0.034	1							

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-114			AOI6 BH-12-115			AOI6 BH-12-119			AOI6 BH-12-120			AOI6 BH-12-122													
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data													
				Sample ID	BH-12-114_1-1.5'			BH-12-115_1-2'			BH-12-119_0.5-1'			BH-12-120_0-1'			BH-12-122_1-1.5'													
				Sample Matrix	Soil			Soil			Soil			Soil			Soil													
				Sample Depth	1-1.5			1.5-2			0.5-1			0-1			1-1.5													
				Sample Date	12/3/2012			12/3/2012			12/4/2012			12/4/2012			12/3/2012													
Unit				Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF											
Volatile Organic Compounds				Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.00094	1	ND	U	0.00094	1	ND	U	0.001	1	ND	U	0.0013	1	0.00088	1				
Semi-Volatile Organic				Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.1	0.035	1	0.766	0.036	1	0.587	0.074	2	0.555	0.043	1	0.915	0.032	1							
				Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.0047	1	ND	U	0.0047	1	ND	U	0.0051	1	ND	U	0.0063	1	0.0051	0.0044	1			
				Phenanthrene	85-01-8	10000	170000	mg/kg	0.055	0.035	1	0.2	0.036	1	0.17	0.074	2	0.243	0.043	1	0.456	0.032	1							

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-123			AOI6 BH-12-129			AOI6 BH-12-130			AOI6 BH-12-131			AOI6 BH-12-135		
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data		
				Sample ID	BH-12-123_1-1.5'			BH-12-128_1.5-2'			BH-12-130_1-2'			BH-12-131_1-2'			BH-12-135_1-1.5'		
				Sample Matrix	Soil			Soil			Soil			Soil			Soil		
				Sample Depth	1-1.5			1.5-2			1-2			1-2			1-1.5		

Table 1a
Summary of Surface Soil (0-2 ft) Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-136			AOI6 BH-12-137			AOI6 BH-12-138			AOI6 BH-12-139			AOI6 BH-12-140							
				Data Type	Langen Data			Langen Data			Langen Data			Langen Data			Langen Data							
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.00084	1	ND	U	0.00091	1	ND	U	0.0015	1	ND	U	0.00097	1	ND	U	0.0012	1
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.122		0.035	1	0.141		0.036	1	0.169		0.041	1	0.144		0.036	1	0.0844		0.036	1
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.035	1	ND	U	0.036	1	ND	U	0.041	1	ND	U	0.036	1	ND	U	0.036	1
Phenanthrene	85-01-8	10000	170000	mg/kg	0.373		0.035	1	0.556		0.036	1	0.138		0.041	1	0.26		0.036	1	0.0474		0.036	1

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-144			AOI6 BH-12-146			AOI6 BH-12-147			AOI6 BH-12-148			AOI6 BH-12-149							
				Data Type	Langen Data			Langen Data			Langen Data			Langen Data			Langen Data							
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.00083	1	ND	U	0.00098	1	ND	U	0.00089	1	ND	U	0.0011	1	ND	U	0.07	1
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	ND	U	0.033	1	0.982		0.038	1	0.0542		0.034	1	0.205		0.041	1	0.0459		0.037	1
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.033	1	ND	U	0.038	1	ND	U	0.034	1	ND	U	0.041	1	ND	U	0.35	1
Phenanthrene	85-01-8	10000	170000	mg/kg	ND	U	0.033	1	0.329		0.038	1	ND	U	0.034	1	0.425		0.041	1	ND	U	0.037	1

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 C-165			AOI6 C-168			AOI6 C-169			AST-250-SS-1			AST-250-SS-2							
				Data Type	Langen Data			Langen Data			Langen Data			Historical Tank Data			Historical Tank Data							
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.25	1	ND	U	0.0013	1	ND	U	0.0016	1	ND	UD	0.081	50	ND	UD	0.097	50
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.912		0.26	1	0.612		0.038	1	0.0751		0.045	1	NA		NA					
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.26	1	ND	U	0.038	1	ND	U	0.045	1	0.052	JD	0.081	50	0.067	JD	0.097	50
Phenanthrene	85-01-8	10000	170000	mg/kg	10.6		0.26	1	0.165		0.038	1	ND	U	0.045	1	NA		NA					

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AST-250-SS-3			AST-250-SS-4			AST-250-SS-5			AST-250-SS-6			AST-250-SS-7							
				Data Type	Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data							
Ethylbenzene	100-41-4	70	27	mg/kg	ND	UD	0.088	50	ND	UD	0.1	50	ND	UD	0.11	50	ND	UD	0.069	50	ND	UD	0.078	50
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	NA			NA			NA			NA			NA			NA				
Naphthalene	91-20-3	25	18	mg/kg	0.31	D	0.088	50	4.2	D	0.1	50	0.081	JD	0.11	50	0.065	JD	0.069	50	0.055	JD	0.078	50
Phenanthrene	85-01-8	10000	170000	mg/kg	NA			NA			NA			NA			NA			NA				

Table 1a
Summary of Surface Soil (0-2 ft) Analytical Results
AOI-6 SCR/NIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RS ² (mg/kg)	Location	AST-250-SS-8			B-151			B-152			B-153			B-154							
				Data Type	Historical Tank Data			Langan Data			Langan Data			Langan Data			Langan Data							
				Sample ID	AST-250-SS-8			BH-B151-030106-0.5-1			BH-B152-030106-1.5-2			BH-B153-030106-1.5-2			BH-B154-030106-1-1.5							
				Sample Matrix	Soil			Soil			Soil			Soil			Soil							
				Sample Depth	0-0.5			0.5-1			1.5-2			1.5-2			1-1.5							
				Sample Date	5/15/2007			3/1/2006			3/1/2006			3/1/2006			3/1/2006							
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF				
Volatile Organic Compounds																								
Ethylbenzene	100-41-4	70	27	mg/kg	ND	UD	0.092	50	ND	U	0.2	35.92	0.24	0.2	33.07	ND	U	0.42	49.5	1.8	0.16	26.97		
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	NA				ND	U	0.92	1	ND	U	3	5	ND	U	0.28	1	ND	U	5.8	10
Naphthalene	91-20-3	25	18	mg/kg	0.075	JD	0.092	50	8.6		0.92	1	ND	U	3	5	ND	U	0.28	1	6.8	10		
Phenanthrene	85-01-8	10000	170000	mg/kg	NA				2.9		0.92	1	ND	U	3	5	ND	U	0.28	1	31	1	5.8	10

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RS ² (mg/kg)	Location	B-155			B-156			B-157			B-160			B-161							
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data							
				Sample ID	BH-B155-032006-1.5-2			BH-B156-032006-1-1.5			BH-B157-030106-1-1.5			BH-B160-030106-1-1.5			BH-B161-030106-1.5-2							
				Sample Matrix	Soil			Soil			Soil			Soil			Soil							
				Sample Depth	1.5-2			1-1.5			1-1.5			1.5-2			1.5-2							
				Sample Date	3/20/2006			3/20/2006			3/1/2006			3/1/2006			3/1/2006							
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF				
Volatile Organic Compounds																								
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.022	31.81	ND	U	0.005	0.72	ND	U	0.24	38.28	ND	U	0.005	0.71	ND	U	0.44	68.87
Semi-Volatile Organic																								
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.31		0.23	1	0.42		0.21	1	ND	U	1.1	1	ND	U	0.22	1	1.3		0.21	1
Naphthalene	91-20-3	25	18	mg/kg	0.7		0.23	1	0.37		0.21	1	ND	U	1.1	1	ND	U	0.22	1	0.34		0.21	1
Phenanthrene	85-01-8	10000	170000	mg/kg	3		0.23	1	4.3		0.21	1	ND	U	1.1	1	ND	U	0.22	1	0.41		0.21	1

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RS ² (mg/kg)	Location	B-162			B-164			BH-02-06			BH-03-06			BH-13-06						
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data						
				Sample ID	BH-B162-030106-1-1.5			BH-B164-030106-1.5-2			BH-02-06-032206-1.5-2			BH-03-06-032206-1.5-2			BH-13-06-032206-1.5						
				Sample Matrix	Soil			Soil			Soil			Soil			Soil						
				Sample Depth	1.1.5			1.5-2			1.5-2			1.5-2			1-1.5						
				Sample Date	3/21/2006			3/20/2006			3/22/2006			3/22/2006			3/22/2006						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																							
Ethylbenzene	100-41-4	70	27	mg/kg	NA			0.46	0.2		31.37	0.81	0.19	34.77	ND	U	0.004	0.64	ND	U	0.21	33.03	
Semi-Volatile Organic																							
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	NA			2.9	2.1	10	ND	U	1.8	10	0.29	0.19	1	0.89	0.63	1			
Naphthalene	91-20-3	25	18	mg/kg	NA				ND	U	2.1	10	ND	U	1.8	10	ND	U	0.19	1	0.98	0.63	1
Phenanthrene	85-01-8	10000	170000	mg/kg	NA				37	2.1	10	ND	U	1.8	10	ND	U	0.19	1	7.4	0.63	1	

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RS ² (mg/kg)	Location	BH-14-06			BH-20-06			BH-21-06			BH-22
---------------	-------	---	--	----------	----------	--	--	----------	--	--	----------	--	--	-------

Table 1a
Summary of Surface Soil (0-2 ft) Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	BH-24-06			BH-25-06			BH-26-06			BH-27-06			BH-27-09						
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data						
				Sample ID	BH-24-06-032106-1-1.5			BH-25-06-032106-1-1.5			BH-26-06-032406-0.5-1			BH-27-06-032306-1-1.5			BH-27-09						
				Sample Matrix	Soil			Soil			Soil			Soil			Soil						
				Sample Depth	1-1.5			1-1.5			0.5-1			1-1.5			0-2						
				Sample Date	3/21/2006			3/21/2006			3/24/2006			3/23/2006			4/8/2009						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																							
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.17	29.69	0.3	0.22	35.11	2.7	0.18	32.94	1.6	0.18	31.49	NA					
Semi-Volatile Organic																							
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	ND	U	1.9	10	3.6	2.1	10	ND	U	0.18	1	ND	U	1.9	10	NA			
Naphthalene	91-20-3	25	18	mg/kg	ND	U	1.9	10	2.4	2.1	10	ND	U	0.18	1	12	1.9	10	NA				
Phenanthrene	85-01-8	10000	170000	mg/kg	46		1.9	10	120	10	50	0.21	0.18	1	36	1.9	10	NA					

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	BH-28-06			BH-29-06			BH-29-09			BH-30-09									
				Data Type	Langan Data			Langan Data			Langan Data			Langan Data			Langan Data						
				Sample ID	BH-28-06-032306-1-1.5			BH-28-08			BH-29-06-032106-1.5-2			BH-29-09			BH-30-09						
				Sample Matrix	Soil			Soil			Soil			Soil			Soil						
				Sample Depth	1-1.5			0-2			1.5-2			0-2			0-2						
				Sample Date	3/23/2006			4/8/2009			3/21/2006			4/8/2009			4/8/2009						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																							
Ethylbenzene	100-41-4	70	27	mg/kg	0.67		0.38	66.49	NA				ND	U	0.23	36.55	NA			NA			
Semi-Volatile Organic																							
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	1.9		0.19	1	NA				29		2.1	10	NA			NA			
Naphthalene	91-20-3	25	18	mg/kg	0.19		0.19	1	NA				2.4		2.1	10	NA			NA			
Phenanthrene	85-01-8	10000	170000	mg/kg	16		0.96	5	NA				91		10	50	NA			NA			

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	GP 797-HA-1			GP 797-HA-2			GP 797-HA-3			GP 797-HA-3			GP 797-HA-4						
				Data Type	Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data						
				Sample ID	HA-1 (1-1.5)			HA-2 (1-1.5)			HA-3 (1-1.5)			HA-3 (2)			HA-4 (1-1.5)						
				Sample Matrix	Soil			Soil			Soil			Soil			Soil						
				Sample Depth	1-1.5			1-1.5			1-1.5			1.5-2			0-1.3						
				Sample Date	8/29/2002			5/24/2002			5/24/2002			5/24/2002			5/24/2002						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																							
Ethylbenzene	100-41-4	70	27	mg/kg	3.7		0.31	48.26	0.52	0.33	47.53	14		1.1	187.97	0.11	J	0.07	55.27	ND			
Semi-Volatile Organic																			0.001				
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	NA			NA			NA			1.7		0.051	20	0.19	J	0.051			
Naphthalene	91-20-3	25	18	mg/kg	1.8		0.31	48.26	1.9	0.33	47.53	4.8		1.1	187.97	0.29	J	0.07	55.27	ND			
Phenanthrene	85-01-8	10000	170000	mg/kg	NA			NA			NA			2.2		0.051	20	0.09	J	0.051			

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	GP 797-MW-1			GP 797-MW-2			GP 797-MW-3			GP U 677-1			GP U 677-2		
				Data Type	Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data			Historical Tank Data		
				Sample ID	MW-1(1-1.5), 09/17/2002			MW-2(1-1.5), 09/17/2002			MW-3(1-1.5), 09/16/2002			GP U 677-1, 06/08/2011			GP U 677-2, 06/08/2011		
				Sample Matrix	Soil			Soil			Soil			Soil			Soil		
				Sample Depth	1-1.5			1-1.5			1-1.5			1.5-2			0.8-1.3		
				Sample Date	8/17/2002			8/17/2002			9/16/2002								

Table 1a
Summary of Surface Soil (0-2 ft) Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location			GP U 677-4			GP U 677-5						
				Data Type	Historical Tank Data	Historical Tank Data	Sample ID	GP U 677-3, 06/08/2011	GP U 677-4, 06/08/2011	Sample Matrix	Soil	Soil	Sample Depth	1.5-2	0.3-0.8	0.8-1.3
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
Volatile Organic Compounds																
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.001	0.82	ND	U	0.001	0.98	ND	U	0.001	1
Semi-Volatile Organic																
Benzo(G,H,I)Perylene	191-24-2	180	33000	mg/kg	1.5	0.051	20	0.13	J	0.043	20	1.4	0.11	50		
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.001	0.82	ND	U	0.001	0.98	0.16	0.001	1	
Phenanthrene	85-01-8	10000	170000	mg/kg	1.6	0.051	20	0.095	J	0.043	20	5.2	0.11	50		

Notes:

All soil samples were unsaturated.

¹Medium Specific Concentration (MSC) for unsaturated, surface or sub-surface soils, used aquifer w/ total dissolved solids less than 2,500 mg/L [HQ=1.0, TR=1.0E-05].

²Industrial Regional Screening Level for a composite worker (indoor/outdoor worker) [HQ=1.0, TR=1.0E-06]. Basis & background provided in correspondence from Sunoco to EPA dated Nov. 7, 2012.

Key:

CAS # - Chemical Abstract System Number

DF - Dilution Factor

EPA R3 - Environmental Protection Agency Region 3

J - Compound was detected below the reporting limit and should be considered an estimate.

mg/kg - milligram per kilogram

MSC - medium specific concentration

PADEP - Pennsylvania Department of Environmental Protection

Q - Qualifier

RL - Laboratory Reporting Limit

RSL - Regional Screening Level

SO - soil

U - The analyte was analyzed but not detected above the method detection limit.

Exceedance Summary:

Concentration detected above the more stringent of the two criteria, PADEP Non-Residential Soil MSC or EPA Region 3 RSL.

Table 1b
Summary of Subsurface Soil (2-15 ft) Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 B-166				AOI6 B-167				AOI6 BH-12-101				AOI6 BH-12-102				AOI6 BH-12-105						
				Data Type	Langan Data				Langan Data				Langan Data				Langan Data				Langan Data						
				Sample ID	B-166_3'				B-167_4'				BH-12-101_2-3'				BH-12-102_2-2.5'				BH-12-105_2-2.5'						
				Sample Matrix	Soil				Soil				Soil				Soil				Soil						
				Sample Depth	2.5-3				3.5-4				2-3				2-2.5				2-2.5						
				Sample Date	12/13/2012				12/13/2012				12/4/2012				12/4/2012				12/3/2012						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																											
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.0017	1	0.309	0.059	1	0.0679	0.063	1	ND	U	0.13	1	0.976	0.36	1						
Semi-Volatile Organic Compounds																											
Benzo(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.0802		0.042	1	1.26	0.037	1	0.0816	0.037	1	0.304	0.049	1	1.15	0.035	1							
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.042	1	0.226	0.037	1	ND	U	0.32	1	ND	U	0.66	1	ND	U	1.8	1				
Phenanthrene	85-01-8	10000	170000	mg/kg	0.314		0.042	1	5.2	0.15	4	0.0748	0.037	1	10.4	0.25	5	3.34	0.035	1							

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-106				AOI6 BH-12-107				AOI6 BH-12-108				AOI6 BH-12-109				AOI6 BH-12-110						
				Data Type	Langan Data				Langan Data				Langan Data				Langan Data				Langan Data						
				Sample ID	BH-12-106_2-2.5'				BH-12-107_2.5-3'				BH-12-108_2-2.5'				BH-12-109_3'				BH-12-110_3-3.5'						
				Sample Matrix	Soil				Soil				Soil				Soil				Soil						
				Sample Depth	2-2.5				2.5-3				2-2.5				2.5-3				3-3.5						
				Sample Date	12/3/2012				12/3/2012				12/3/2012				12/3/2012				12/3/2012						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																											
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	0.00094	1	ND	0.0011	1	0.00095	2.3	1	0.153	0.061	1	0.712	0.35	1							
Semi-Volatile Organic Compounds																											
Benzo(G,H,I)Perylene	191-24-2	180	33000	mg/kg	7.06		0.71	20	2.53	0.035	1	4.07	0.32	10	6.29	0.071	2	11.9	1.5	40							
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.0047	1	ND	U	0.0053	1	0.052	12	1	0.512	0.31	1	2.49	1.8	1						
Phenanthrene	85-01-8	10000	170000	mg/kg	10.7		0.71	20	7.48	0.35	10	18.5	0.32	10	24.9	0.71	20	44.4	1.5	40							

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-114				AOI6 BH-12-116				AOI6 BH-12-117				AOI6 BH-12-118				AOI6 BH-12-121						
				Data Type	Langan Data				Langan Data				Langan Data				Langan Data				Langan Data						
				Sample ID	BH-12-114_3-3.5'				BH-12-116_3.5'				BH-12-117_2-2.5'				BH-12-118_2-2.5'				BH-12-121_2-2.5'						
				Sample Matrix	Soil				Soil				Soil				Soil				Soil						
				Sample Depth	3-3.5				3-3.5				2-2.5				2.5-3				2.5-3						
				Sample Date	12/3/2012				12/3/2012				12/3/2012				12/4/2012				12/4/2012						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Volatile Organic Compounds																											
Ethylbenzene	100-41-4	70	27	mg/kg	0.191		0.056	1	0.464	0.049	1	5.87	0.47	1	ND	U	2.5	1	14.6	0.26	1						
Semi-Volatile Organic Compounds																											
Benzo(G,H,I)Perylene	191-24-2	180	33000	mg/kg	0.764		0.032	1	3.58	0.35	10	ND	U	0.033	1	ND	U	0.035	1	ND	U	0.073	2				
Naphthalene	91-20-3	25	18	mg/kg	0.5		0.28	1	1.11	0.25	1	ND	U	0.35	1	ND	U	12	1	ND	U	1.3	1				
Phenanthrene	85-01-8	10000	170000	mg/kg	2.03		0.032	1	6.1	0.35	10	0.0626	0.033	1	ND	U	0.035	1	0.115	1	0.073	2					

Table 1b
Summary of Subsurface Soil (2-15 ft) Analytical Results
AOI-8 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-127			AOI6 BH-12-128			AOI6 BH-12-129			AOI6 BH-12-135			AOI6 BH-12-138									
				Data Type	Langen Data			Data Type	Langen Data			Data Type	Langen Data			Data Type	Langen Data									
				Sample ID	BH-12-127_2.5'-3'			Sample ID	BH-12-128_3-3.5'			Sample ID	BH-12-129_2.5'-3'			Sample ID	BH-12-135_2-2.5'									
				Sample Matrix	Soil			Sample Matrix	Soil			Sample Matrix	Soil			Sample Matrix	Soil									
				Sample Depth	2.5-3			Sample Depth	3-3.5			Sample Depth	2.5-3			Sample Depth	2-2.5									
				Sample Date	12/4/2012			Sample Date	12/4/2012			Sample Date	12/4/2012			Sample Date	12/5/2012									
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF						
Volatile Organic Compounds																										
Ethylbenzene	100-41-4	70	27	mg/kg	18.7		2.5	1	ND	U	0.032	1	ND	U	0.035	1	0.0832	0.07	2	1.27	0.042	1	0.378	0.09	2	
Semi-Volatile Organic Compounds																										
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	ND	U	0.032	1	ND	U	0.035	1	ND	U	0.0832	0.07	2	1.27	0.042	1	0.378	0.09	2			
Naphthalene	91-20-3	25	18	mg/kg	ND	U	0.25	1	ND	U	0.25	1	ND	U	1.4	1	0.524	0.042	1	ND	U	0.09	2			
Phenanthrene	85-01-8	10000	170000	mg/kg	ND	U	0.032	1	ND	U	0.035	1	0.437		0.07	2	1.16	0.042	1	0.609		0.09	2			

Chemical Name	CAS #	PADEP Non-Residential Soil MSC - Unsaturated ¹ (mg/kg)	EPA R3 Industrial Soil RSL ² (mg/kg)	Location	AOI6 BH-12-149																					
				Data Type	Langen Data																					
				Sample ID	BH-12-149_2.5'-3'																					
				Sample Matrix	Soil																					
				Sample Depth	2.5-3																					
				Sample Date	12/4/2012																					
				Unit	Result	Q	DL	DF																		
Volatile Organic Compounds																										
Ethylbenzene	100-41-4	70	27	mg/kg	ND	U	1.4	1																		
Semi-Volatile Organic Compounds																										
Benzol(G,H,I)Perylene	191-24-2	180	33000	mg/kg	ND	U	0.458	1	0.035	1	0.0832	0.07	2	1.27	0.042	1	0.378	0.09	2							
Naphthalene	91-20-3	25	18	mg/kg	ND	U	7	1																		
Phenanthrene	85-01-8	10000	170000	mg/kg	ND	U	0.154	1	0.036	1																

Notes:

All soil samples were unsaturated.

¹Medium Specific Concentration (MSC) for unsaturated, surface or sub-surface soils, used aquifer w/ total dissolved solids less than 2,500 mg/L [HQ=1.0, TR=1.0E-05].

²Industrial Regional Screening Level for a composite worker (indoor/outdoor worker) [HQ=1.0, TR=1.0E-06]. Basis & background provided in correspondence from Sunoco to EPA dated Nov. 7, 2012.

Key:

CAS # - Chemical Abstract System Number

DF - Dilution Factor

EPA R3 - Environmental Protection Agency Region 3

J - Compound was detected below the reporting limit and should be considered an estimate.

mg/kg - milligram per kilogram

MSC - medium specific concentration

PADEP - Pennsylvania Department of Environmental Protection

Q - Qualifier

RL - Laboratory Reporting Limit

RSL - Regional Screening Level

SO - soil

U - The analyte was analyzed but not detected above the method detection limit.

Exceedance Summary:

Concentration detected above the more stringent of the two criteria, PADEP Non-Residential Soil MSC or EPA Region 3 RSL.

Table 2
Summary of Groundwater Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-115			B-116			B-115			B-116			B-116							
				Sample ID	B115_052405	B115_060706			B115_010413			B116_052405			B116_081006			B116_081006							
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater							
				Sample Date	5/24/2005	6/7/2006			1/4/2013			5/24/2005			5/24/2005			8/10/2006							
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF					
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	1.24	1	1	ND	U	1	1	ND	U	1	1	
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-116			B-117			B-117			B-123			B-123						
				Sample ID	B116_010413	B117_062405			B117_060706			B123_052505			B123_060706			B123_060706						
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater						
				Sample Date	1/4/2013	5/24/2005			6/7/2006			6/6/2006			5/25/2005			6/7/2006						
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF				
Naphthalene	91-20-3	100	7	26	ug/l	0.793	0.1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	0.946	0.1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1	17	1	1	1

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-123			B-125			B-125			B-126			B-126				
				Sample ID	B123_010813	B125_062405			B125_060606			B125_010813			B126_052405			B126_060606				
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater				
				Sample Date	1/8/2013	5/24/2005			6/6/2006			6/6/2006			1/8/2013			5/24/2005				
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Naphthalene	91-20-3	100	7	26	ug/l	2.12	0.11	1	ND	U	1	1	7	1	1	1.16	0.1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	5.34	1.1	1	ND	U	1	1	7	1	1	1.48	0.1	1	ND	U	1	1

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-126			B-126			B-132			B-132			B-133			B-134		
				Sample ID	B126_060606	B126_010713			B132D_060606			B133_010913			B134_010913			B134_010913					
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater			Groundwater					
				Sample Date	6/6/2006	1/7/2013			6/6/2006			6/6/2006			1/9/2013			1/9/2013					
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF			
Naphthalene	91-20-3	100	7	26	ug/l	23	1	1	25.3	1	1	ND	U	1	1	1.41	0.1	1	0.964	0.1	1		
Phenanthrene	85-01-8	1100	NS	4700	ug/l	16	1	1	54.4	1	1	ND	U	1	1	32.7	1	1	29	1	1		

Table 2
Summary of Groundwater Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-135			B-144			B-145			B-145			B-145							
				Sample ID	B135_010913	Sample ID	B144_010813	Sample Matrix	Groundwater	Sample Matrix	Groundwater	Sample Date	1/9/2013	Sample Matrix	Groundwater	Sample Date	5/26/2005	Sample Matrix	Groundwater	Sample Date	6/9/2006	Sample Matrix	Groundwater	Sample Date	1/8/2013
				Unit	ug/l	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic																				
Semi-Volatile Organic Compounds																									
Naphthalene	91-20-3	100	7	26	ug/l	1.86	0.1	1	4.01	0.1	1	11	1	1	11	1	1	3.4	0.1	1	1	1			
Phenanthrene	85-01-8	1100	NS	4700	ug/l	32.7	1	1	0.917	0.1	1	24	1	1	43	1	1	11.7	1	1	11.7	1			

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-149			B-149			B-149			B-151			B-151							
				Sample ID	B149_062505	Sample ID	B149_060806	Sample Matrix	Groundwater	Sample Matrix	Groundwater	Sample Date	5/25/2006	Sample Matrix	Groundwater	Sample Date	6/9/2006	Sample Matrix	Groundwater	Sample Date	1/7/2013	Sample Matrix	Groundwater	Sample Date	6/8/2006
				Unit	ug/l	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic																				
Semi-Volatile Organic Compounds																									
Naphthalene	91-20-3	100	7	26	ug/l	32	1	1	7	1	1	27.7	1	1	ND	U	1	1	0.453	0.1	1	1			
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	1	1	7.35	1	1	ND	U	1	1	0.114	0.1	1		

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-152			B-153			B-152			B-153			B-154							
				Sample ID	B152-060906	Sample ID	B153-060906	Sample Matrix	Groundwater	Sample Matrix	Groundwater	Sample Date	6/9/2006	Sample Matrix	Groundwater	Sample Date	6/9/2006	Sample Matrix	Groundwater	Sample Date	1/7/2013	Sample Matrix	Groundwater	Sample Date	6/8/2006
				Unit	ug/l	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic																				
Semi-Volatile Organic Compounds																									
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	1.46	0.1	1	0.466	0.1	1	76	1	1			
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	1	1	2.3	0.1	1	ND	U	0.1	1	18	1	1		

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		B-154			B-155			B-155			B-156			B-156							
				Sample ID	B-154_010713	Sample ID	B155-060806	Sample Matrix	Groundwater	Sample Matrix	Groundwater	Sample Date	1/7/2013	Sample Matrix	Groundwater	Sample Date	6/8/2006	Sample Matrix	Groundwater	Sample Date	6/8/2006	Sample Matrix	Groundwater	Sample Date	1/7/2013
				Unit	ug/l	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic																				
Semi-Volatile Organic Compounds																									
Naphthalene	91-20-3	100	7	26	ug/l	57.3	1	1	22	1	1	52.4	1	1	ND	U	1	1	1.65	0.1	1	1			
Phenanthrene	85-01-8	1100	NS	4700	ug/l	17	1	1	14	1	1	8.73	1	1	17	1	1	9.87	1	1	1	1			

Table 2
Summary of Groundwater Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location	B-157				B-158				B-158				B-159				B-160				
				Sample ID	B157-060906				B158-060806				B158_010713				B159-060806				B160-060806				
				Sample Matrix	Groundwater				Groundwater				Groundwater				Groundwater				Groundwater				
				Sample Date	6/9/2006		6/8/2006		1/7/2013		1/7/2013		6/8/2006		6/8/2006		6/8/2006		6/8/2006		6/8/2006		6/8/2006		
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	0.155	0.1	1	ND	U	1	1	ND	U	1	1	
Phenanthrene	85-01-8	1100	NS	4700	ug/l	25		1	1	ND	U	1	1	ND	U	0.1	1	ND	U	1	1	ND	U	1	1

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location	B-160				B-162				B-162				B-163				B-163			
				Sample ID	B160_010713				B162-081006				B162_010413				B163-060906				B163_010713			
				Sample Matrix	Groundwater				Groundwater				Groundwater				Groundwater				Groundwater			
				Sample Date	1/7/2013		8/10/2006		1/4/2013		1/4/2013		1/7/2013		1/7/2013		6/9/2006		1/7/2013		1/7/2013		1/7/2013	
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	0.304	0.1	1	1.29	0.1	1	0.438	0.1	1	2.08	0.1	1	0.1	1	
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	0.1	1	0.446	0.1	1	ND	U	0.1	1	0.289	0.1	1	

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location	B-164				B-164				B-165				B-166				B-167					
				Sample ID	B164-060606				B164_010813				B165_010413				B166_010713				B167_010713					
				Sample Matrix	Groundwater				Groundwater				Groundwater				Groundwater				Groundwater					
				Sample Date	6/6/2006		1/8/2013		1/4/2013		1/9/2013		1/7/2013		1/7/2013		1/8/2013		5/25/2005		5/25/2005		5/25/2005			
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Naphthalene	91-20-3	100	7	26	ug/l	1.38	0.1	1	41.7	0.1	1	0.165	0.1	1	ND	U	0.1	1	ND	U	1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	0.172	0.1	1	1.44	0.1	1	0.296	0.1	1	74.9	1	1	ND	U	1	1	ND	U	1	1	

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location	B-168				B-169				B-169				B-39				B-46					
				Sample ID	B-168_010413				B-169_010413				B-169_010913				B39_010813				B46-052505					
				Sample Matrix	Groundwater				Groundwater				Groundwater				Groundwater				Groundwater					
				Sample Date	1/4/2013		1/4/2013		1/9/2013		1/9/2013		1/8/2013		1/8/2013		5/25/2005		5/25/2005		5/25/2005		5/25/2005			
Semi-Volatile Organic Compounds				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Naphthalene	91-20-3	100	7	26	ug/l	1.38	0.1	1	41.7	0.1	1	0.165	0.1	1	ND	U	0.1	1	ND	U	1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	0.172	0.1	1	1.44	0.1	1	0.296	0.1	1	74.9	1	1	ND	U	1	1	ND	U	1	1	

Table 2
Summary of Groundwater Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location			B-46			B-46			B-48			B-48			B-48					
				Sample ID	B46-060706		Sample Matrix	Groundwater		Sample Date	6/7/2006		Result	Q	DL	DF	Result	Q	DL	DF <th>Result</th> <td>Q</td> <td>DL</td> <td>DF</td>	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic	Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Semi-Volatile Organic Compounds																								
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	0.914	0.1	1	ND	U	1	1	ND	U	1	1	1.44	1	1	
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	0.219	0.1	1	ND	U	1	1	ND	U	1	1	1.26	1	1	

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location			B-92			B-92			B-92			B-94			B-94					
				Sample ID	B92-062505		Sample Matrix	Groundwater		Sample Date	6/25/2005		Result	Q	DL	DF	Result	Q	DL	DF <th>Result</th> <td>Q</td> <td>DL</td> <td>DF</td>	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic	Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Semi-Volatile Organic Compounds																								
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	1.18	0.1	1	ND	U	1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	15	1	1	15	1	1	30.4	1	1	ND	U	1	1	ND	U	1	1	ND	U

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location			B-94			U-1			U-2			U-4			U-4					
				Sample ID	B94-010713		Sample Matrix	Groundwater		Sample Date	1/7/2013		Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic	Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Semi-Volatile Organic Compounds																								
Naphthalene	91-20-3	100	7	26	ug/l	0.601	0.1	1	1	ND	60	10	1	ND	U	1	1	ND	U	1	1	0.692	0.1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	1.18	0.1	1	1100	10	1	ND	U	1	1	ND	U	1	1	3.29	0.1	1	ND	U

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location			U-5			URS-1			URS-1			URS-2			URS-2					
				Sample ID	U5-060606		Sample Matrix	Groundwater		Sample Date	6/6/2006		Result	Q	DL	DF	Result	Q	DL	DF <th>Result</th> <td>Q</td> <td>DL</td> <td>DF</td>	Result	Q	DL	DF
				Carcinogenic	Non-Carcinogenic	Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF		
Semi-Volatile Organic Compounds																								
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	1.74	0.1	1	ND	U	1	1	1.24	0.1	1	
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	1	1	0.127	0.1	1	6	1	1	1	1.99	0.1	1	

Table 2
Summary of Groundwater Analytical Results
AOI-6 SCR/RIR
Philadelphia Energy Solutions Facility
Philadelphia, Pennsylvania

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		URS-3			URS-3			URS-4			URS-4			URS-5			
				Sample ID	B134U-052505	URS3-060606			URS4-060606			URS-4_010913			URS5-060606						
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater						
				Sample Date	5/25/2005	6/6/2006			6/6/2006			1/9/2013			6/6/2006						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	
Semi-Volatile Organic Compounds																					
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	ND	U	1	1	0.268	0.1	1	270
Phenanthrene	85-01-8	1100	NS	4700	ug/l	21		1	1	260		5	5	ND	U	1	1	0.113	0.1	1	25

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		WP16-5			WP16-5			WP9-1			WPM-11			WPM-11			
				Sample ID	WP16-5-052605	WP16-5-060906			WP9-1-052505			WPM11-052605			WPM11-060906						
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater			Groundwater						
				Sample Date	5/26/2005	6/9/2006			5/26/2005			6/9/2006			5/26/2005						
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF	
Semi-Volatile Organic Compounds																					
Naphthalene	91-20-3	100	7	26	ug/l	ND	U	1	1	ND	U	1	1	ND	U	1	1	ND	U	1	1
Phenanthrene	85-01-8	1100	NS	4700	ug/l	ND	U	1	1	ND	U	1	1	14	1	1	200	5	1	14	1

Chemical Name	CAS #	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial RSL ² (ug/l)	Location		WPM-11			WPM-8			WPM-8								
				Sample ID	WPM-11_010913	WPM8-062605			WPM8-060906			WPM8-060906								
				Sample Matrix	Groundwater	Groundwater			Groundwater			Groundwater								
				Sample Date	1/9/2013	5/26/2005			6/9/2006			6/9/2006								
				Unit	Result	Q	DL	DF	Result	Q	DL	DF	Result	Q	DL	DF				
Semi-Volatile Organic Compounds																				
Naphthalene	91-20-3	100	7	26	ug/l	1.86	0.5	5	ND	U	1	1	ND	U	1	1				
Phenanthrene	85-01-8	1100	NS	4700	ug/l	96.5	5	5	2		1	1	ND	U	1	1				

Notes:

¹MSC for used aquifer w/ total dissolved solids less than 2,500 mg/L (HQ=1.0, TR=1.0E-05) [the MSC for naphthalene is based on the EPA HAL – 2012 EPA Health Advisory Level with TR=1.0E-04].

²Calculated Industrial Regional Screening Level for a composite worker (indoor/outdoor worker) [HQ=1.0, TR=1.0E-05]. Basis & background provided in correspondence from Sunoco to EPA dated Nov. 7, 2012.

Key:

CAS # - Chemical Abstract System Number

DF - Dilution Factor

EPA R3 - Environmental Protection Agency Region 3

J - Compound was detected below the reporting limit and should be considered an estimate.

MSC - medium specific concentration

PADEP - Pennsylvania Department of Environmental Protection

Q - Qualifier

RL - Laboratory Reporting Limit

RSL - Regional Screening Level

U - The analyte was analyzed but not detected above the method detection limit.

ug/L - micrograms per liter

Exceedance Summary:

Concentration detected above the Carcinogenic EPA Region 3 RSL.
 Concentration detected above the Non-Carcinogenic EPA Region 3 RSL.

Attachment 1



November 7, 2012

Mr. Paul Gotthold
U.S. Environmental Protection Agency
1650 Arch Street
WCMD 3WC 22
Philadelphia, PA 19103

Re: Development of Site-Specific Soil and Groundwater Criteria for Sunoco Marcus Hook and Philadelphia Refineries

Dear Mr. Gotthold:

Sunoco, Inc. (R&M) (Sunoco) is submitting this letter in response to the United States Environmental Protection Agency's (EPA) letter dated April 19, 2012 regarding the Current Conditions Report and Comprehensive Remedial Plan for the Sunoco Marcus Hook Refinery. In the April 19 letter the EPA requested that Sunoco prepare a separate assessment to address four compounds of concern (COC) in soil and two COCs in groundwater. These compounds were identified because EPA believes the PADEP statewide health standards fall outside EPA Corrective Action's acceptable risk based range or because EPA doesn't have published screening levels for comparison. These COCs are:

Soil: Benzo(g,h,i)perylene, Ethylbenzene, Naphthalene, and Phenanthrene.

Groundwater: Naphthalene and Phenanthrene.

Based upon EPA's request, Langan compiled the available and applicable standards for the compounds listed above and presented the standards to EPA during a meeting on Tuesday, September 4, 2012. Following discussions, EPA conditionally approved Sunoco's proposed approach but requested this letter detailing the calculations and variables used to derive the proposed standards before issuing final approval. This information is discussed [by medium] in the sections below.

Soil

The generic [non-residential or worker] soil screening levels provided by the PADEP and EPA Region 3 (EPA) were compiled for Benzo(g,h,i)perylene, Ethylbenzene, Naphthalene, and Phenanthrene and reviewed as part of this evaluation. Generic screening levels from the EPA were available for both Ethylbenzene and Naphthalene; however, no screening levels were available for Benzo(g,h,i)perylene or Phenanthrene from EPA. Because no screening levels were available from EPA for these compounds, an industrial soil RSL was calculated using the

EPA's default formulas and exposure parameters. Toxicity data wasn't available for Benzo(g,h,i)perylene or Phenanthrene therefore toxicity data for surrogate compounds were substituted. Specifically, Acenaphthene was used as a surrogate for Benzo(g,h,i)perylene and Anthracene was used as a surrogate for Phenanthrene. For consistency, the surrogate compounds used to calculate the RSLs for these compounds are the same surrogate compounds the PADEP used to develop their medium specific concentrations (MSC). The formulas, input variables, and screening levels [generic and calculated site-specific] are provided below.

1: EPA Industrial Soil RSL Equations [Composite (Indoor/Outdoor) Worker]

Pathway	Non-Carcinogenic Equations
Ingestion	$SL_{w-sol-nc-ing} = \frac{THQ \times AT_w \times ED_w \times BW_w}{EF_w \times ED_w \times \frac{1}{RfD_O} \times IR_w \times CF}$
Dermal	$SL_{w-sol-nc-der} = \frac{THQ \times AT_w \times ED_w \times BW_w}{EF_w \times ED_w \times \frac{1}{RfD_O \times GIABS} \times SA_w \times AF_w \times ABS_d \times CF}$
Inhalation	$SL_{w-sol-nc-inh} = \frac{THQ \times AT_w \times ED_w}{EF_w \times ED_w \times ET_w \times \frac{1}{RfC} \times \left[\frac{1}{VF_S} + \frac{1}{PEF_w} \right]}$
Total	$SL_{w-sol-nc-tot} = \frac{1}{\frac{1}{SL_{w-sol-nc-ing}} + \frac{1}{SL_{w-sol-nc-der}} + \frac{1}{SL_{w-sol-nc-inh}}}$

Note: the compounds requiring a calculated screening level are non-carcinogenic.

2: EPA Industrial Exposure Assumptions [Composite Worker]

Variable	Value	Unit
THQ (target hazard quotient)	1	unitless
AT _w (averaging time)	365	d/yr
EF _w (exposure frequency)	250	d/yr
ED _w (exposure duration)	25	yr
ET _w (exposure time)	8	hr/d
BW _w (body weight)	70	kg
IR _w (soil ingestion rate)	100	mg/d
SA _w (surface area)	3300	cm ²
AF _w (skin adherence factor)	0.2	mg/cm ²
CF (conversion factor)	1.00E-06	kg/mg

3: Chemical Specific Inputs

Chemical	RfD _O mg/kg-d	RfC mg/m	GIABS unitless	ABS _d unitless	VF _s m ³ /kg	PEF _w m ³ /kg
Benzo(g,h,i)perylene <i>(surrogate: Acenaphthene)</i>	6.0E-02	-	1	0.13	1.51E+05	1.36E+09
Phenanthrene <i>(surrogate: Anthracene)</i>	3.0E-01	-	1	0.13	6.93E+05	1.36E+09

Italics indicate surrogate values.

4: Applicable Screening Criteria

Chemical	PADEP Non-Residential Direct Contact (mg/kg) Surface/ Sub-Surface Criteria	PADEP Non-Residential IGW (mg/kg) Unsaturated/ Saturated Criteria	PADEP Non-Residential Soil MSC (mg/kg)		EPA R3 Industrial Soil RSL ³ (mg/kg)
			Unsaturated Soil ¹	Saturated Soil ²	
Benzo(g,h,i)perylene	170,000 / 190,000	180 / 18	180	18	33,000 ⁴
Ethylbenzene	10,000 / 10,000	70 / 70	70	70	27 [270#]
Naphthalene	56,000 / 190,000	25 / 10	25	10	18 [180#]
Phenanthrene	190,000 / 190,000	10,000 / 1,000	10,000	1,000	170,000 ^{4*}

¹Medium Specific Concentration (MSC) for unsaturated, surface or sub-surface soils, used aquifer w/ total dissolved solids less than 2,500 mg/L [HQ=1.0, TR=1.0E-05]. This value represents the lower, more stringent, of the direct contact or unsaturated impact to groundwater (IGW) criteria.

²MSC for saturated, surface or sub-surface soils, used aquifer w/ total dissolved solids less than 2,500 mg/L [HQ=1.0, TR=1.0E-05]. This value represents the lower, more stringent, of the direct contact or saturated impact to groundwater (IGW) criteria.

³EPA Region 3 Regional Screening Level for a composite worker (indoor/outdoor worker) [HQ=1.0, TR=1.0E-06].

⁴ Value calculated using surrogate toxicity data and the Region 3 equations and exposure assumptions.

[#] Value adjusted by a factor of 10 (to increase the level of acceptable risk from EPA's default [1.0E-06] to 1.0E-05).

* Calculated value exceeds ceiling limit: value shown is the ceiling limit.

Any soil data collected at the Philadelphia and Marcus Hook refineries for Ethylbenzene and Naphthalene will be compared to the calculated industrial soil RSLs and any data collected for Benzo(g,h,i)perylene and Phenanthrene will be compared to the PADEP's criteria in accordance with PA Act 2. Subsequent to this letter, a letter will be submitted to EPA with each report submittal discussing the data and, as appropriate, comparing the data to these RSLs.

Groundwater

Similar to soil, the generic [non-residential or worker] groundwater screening levels developed by the PADEP and EPA were compiled for Naphthalene and Phenanthrene and reviewed as part of this evaluation. While the PADEP has groundwater screening levels published for these compounds, EPA has no published screening level for Phenanthrene and the level for Naphthalene is based on a residential exposure scenario and is not considered applicable to the industrial setting at the Sunoco Refineries. Because the EPA's screening level for Naphthalene was based on a residential scenario and no RSL was available for Phenanthrene an industrial worker RSL was calculated for both compounds using the EPA's default formulas and worker exposure parameters. Toxicity data wasn't available for Phenanthrene therefore toxicity data for a surrogate compound was substituted. Consistent with the approach to develop the soil RSLs, the surrogate compound used to calculate the industrial RSL for Phenanthrene was Anthracene (again, the same surrogate compound used by the PADEP in development of the MSCs for Phenanthrene). The formulas, input variables, and screening levels [generic and calculated site-specific] are provided below.

5: EPA Tap-Water RSL Equations [Adjusted for the Composite Worker]

Pathway	Non-Carcinogenic Equations	Carcinogenic Equations
Ingestion	$SL_{w-wat-nc-ing} = \frac{THQ \times AT_{IW} \times ED_{IW} \times BW_{OW} \times CF_{in}}{EF_{IW} \times ED_{IW} \times \frac{1}{RfD_0} \times IRW_{IW}}$	$SL_{w-wat-nc-ing} = \frac{TR \times AT_{IW} \times LT_{IW} \times CF_{in}}{EF_{IW} \times CSF_o \times IFW_{adj}}$
Dermal	$SL_{w-wat-nc-der} = \frac{DA_{event} \times CF_{der}}{2 \times FA \times K_p \sqrt{\frac{6 \times t_{event} \times ET}{\pi}}}$ <p>Where:</p> $DA_{event} = \frac{THQ \times AT_{IW} \times ED_{IW} \times CF_{in} \times BW_{OW}}{\frac{1}{RfD_0 \times GIABS} \times EV_{IW} \times ED_{IW} \times EF_{IW} \times SA_{IW}}$	$SL_{w-wat-nc-der} = \frac{DA_{event} \times CF_{der}}{2 \times FA \times K_p \sqrt{\frac{6 \times t_{event} \times ET}{\pi}}}$ <p>Where:</p> $DA_{event} = \frac{TR \times AT_{IW} \times LT_{IW} \times CF_{in}}{\frac{CSF_o}{GIABS} \times EF_{IW} \times DFW_{adj}}$ $DFW_{adj} = \frac{EV_{IW} \times ED_{IW} \times SA_{IW}}{BW_{IW}}$
Inhalation	$SL_{w-wat-nc-inh} = \frac{THQ \times AT_{OW} \times ED_{OW} \times CF_{in}}{EF_{IW} \times ED_{OW} \times ET_{WS} \times \frac{1}{RfC} \times K}$	$SL_{w-wat-nc-inh} = \frac{TR \times AT_{OW} \times LT_{IW}}{EF_{IW} \times ED_{OW} \times ET_{WS} \times \frac{1}{24} \times IUR \times K}$
Total	$\frac{1}{SL_{w-wat-nc-ing} + SL_{w-wat-nc-der} + SL_{w-wat-nc-inh}}$	$\frac{1}{SL_{w-wat-nc-ing} + SL_{w-wat-nc-der} + SL_{w-wat-nc-inh}}$

6: EPA Industrial Exposure Assumptions [Composite Worker]

Variable	Value	Unit
ED _{IW} (exposure duration - indoor worker)	25	yrs
TR (target risk)	1.0E-05	unitless
THQ (target hazard quotient)	1	unitless
EF _{IW} (exposure frequency - indoor worker)	250	d/yr
ET _{IW} (exposure time - indoor worker)	8	hr/d
ET _{IW} (exposure time - indoor worker showering)	0.58	hr/event
LT _{IW} (lifetime - indoor worker)	70	yrs
EV _{IW} (events - indoor worker)	1	events/d
BW _{IW} (body weight - indoor worker)	70	kg
SA _{IW} (skin surface area - indoor worker)	18000	cm ²
IRW _{IW} (water intake rate - indoor worker)	1	L/day
K (volatilization factor of Andelman)	0.5	L/m ³
AT _{IW} (averaging time - indoor worker)	365	d/yr
CF _{in} (conversion factor: ingestion/inhalation)	1000	ug/mg
CF _{der} (conversion factor: dermal)	1000	cm ³ /L

7: Chemical Specific Inputs

Chemical	RfD _o <i>(mg/kg-d)</i>	CSFo <i>(mg/kg-d)¹</i>	RFC <i>(mg/m³)</i>	IUR <i>(ug/m³)</i>	GIABS <i>unitless</i>	K _p <i>cm/hr</i>	B <i>unitless</i>	τ _{event} <i>hr/event</i>	FA <i>unitless</i>	DA _{event} <i>ug/cm²-event</i>
Naphthalene	2.0E-02	--	3.0E-03	3.4E-05	1	0.047	0.203	0.549	1	1.14E-01
Phenanthrene (Sur: Anthracene)	3.0E-01	--	--	--	1	0.144	0.739	1.047	1	1.7E+00

8: Applicable Screening Criteria

Chemical	PADEP Non-Residential GW MSC ¹ (ug/l)	EPA R3 Industrial Tapwater RSL ² (ug/l)	
		Carcinogenic RSL	Non-Carcinogenic RSL
Naphthalene	100 _{Lifetime HAL}	7.0 ^{^C}	26 ^{^NC}
Phenanthrene	1,100 _{Cap}	--	4,700 [^]

¹MSC for used aquifer w/ total dissolved solids less than 2,500 mg/L (HQ=1.0, TR=1.0E-05) [HAL – 2012 EPA Health Advisory Level based on TR=1.0E-04].

²EPA Region 3 Tapwater Regional Screening Level for a composite worker (indoor/outdoor worker) [HQ=1.0, TR=1.0E-05].

[^] Value calculated using the Region 3 equations, default worker exposure assumptions, and compound specific toxicity data [for Phenanthrene toxicity data for a surrogate compound was substituted].

^C Carcinogenic screening level (based on inhalation only because the toxicity parameters for the remaining pathways aren't published)

^{NC} Non-carcinogenic screening level (based on dermal contact, ingestion, and inhalation)

Based on discussions during the meeting with EPA on September 4, 2012, any groundwater data collected at the Philadelphia and Marcus Hook refineries for these specified compounds will be compared to the calculated industrial RSLs. Two RSLs are provided for Naphthalene: one carcinogenic and one non-carcinogenic. The carcinogenic value is based solely on inhalation because no toxicity data is currently available to assess carcinogenic risks of exposure via ingestion or dermal contact. The non-carcinogenic RSL is based on dermal contact, ingestion, and inhalation. Data for naphthalene will first be screened against the carcinogenic RSL, but any data exceeding the carcinogenic RSL will also be compared to the non-carcinogenic RSL to better understand the potential of risk to exposure. Subsequent to this letter, a letter will be submitted to EPA with each report submittal discussing the data and, as appropriate, comparing the data to these RSLs.

If you have any questions, please feel free to contact me at (610) 833-3444 or jroppenheim@sunocoinc.com.

Sincerely,

James Oppenheim, PE
Sr. Environmental Consultant

cc: Colleen Costello, PG, Langan Engineering
Allison Jelinek, Langan Engineering